I CLAIM:

1. An improvement to a spread-spectrum receiver, comprising:

a spread-spectrum source having a spread-spectrum signal; and

receiver-code means, coupled to said spread-spectrum source, for spread-spectrum processing the spread-spectrum signal with a particular code-division-multiple-access (CDMA) code from a plurality of CDMA code, having a zero correlation window, with an auto-correlation function, within the zero correlation window, having a value of zero except at an origin, and with a cross-correlation function of the particular CDMA code with other CDMA codes in the plurality of CDMA codes, within the zero correlation window, having a value of zero everywhere inside the zero correlation window.

2. The improvement to the spread-spectrum receiver, as set forth in claim 1, wherein said receiver-code means includes:

a receiver-code generator for generating the particular CDMA code from the plurality of CDMA code; and

a mixer, coupled to said spread-spectrum source, for spread-spectrum processing the spread-spectrum signal with the particular CDMA code.

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3. The improvement to the spread-spectrum receiver, as set forth in claim 1, wherein said receiver-code means includes receiver-memory means, coupled to said spread-spectrum source, responsive to the particular CDMA code embedded in the spread-spectrum signal, for storing a plurality of symbols, and for outputting a particular symbol of a plurality of symbols from said receiver-memory means.

4.. The improvement to the spread-spectrum receiver, as set forth in claim 1, wherein said receiver-code means includes a matched filter having an impulse function matched to the particular CDMA code, responsive to detecting the particular CDMA code, for outputting a particular symbol of a plurality of symbols.

5. The improvement to the spread-spectrum receiver, as set forth in claim 1, 2, 3, or 4, wherein the plurality of CDMA codes are generated by:

selecting a pair of basically orthogonal complementary code group (C1, S1), (C2, S2) with each code length having N chips, in which an auto-correlation function and cross-correlation functions of code (C1, C2) and code (S1, S2) oppose each other but also complement each other except at the origin, the value of auto-correlation function and cross-correlation

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functions after summarization are zero except at the origin; and

based on the actually required maximum number of subscriber accesses, spreading, based on the actually required maximum number of subscriber accesses, the code length and code number of the basically orthogonal complementary code group in a tree structure, the values of auto-correlation functions of the spreaded code group are zero except at the origin, while the cross-correlation functions form a zero correlation window about the origin, with the window size at least 2N-1.

6. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein a size of the zero correlation window is at least a maximum relative time delay inside each CDMA code of the system or between them, the maximum relative time delay is dependent on the summation of the maximum time dispersion of the channel and the timing error of the system.

7. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein code C and code S are transmitted respectively by using two orthogonal and fading synchronously transmission channels, and carrying the same spread-spectrum signal bits when modulated, while the outputs are added together after de-spreading and demodulation.

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8. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein the spreading the code length and code number of the basically orthogonal complementary code group in a tree structure refers to:

if **(C1, S1)**, **(C2, S2)** is a pair of basically orthogonal complementary code group with code length N, then the two pairs of orthogonal complementary code group with each code length 2N can be generated according to:

```
                    ┌ C1 C2 S1 S2
                    │ C1 -C2 S1 -S2
C1 S1               │
C2 S2          ─────┤
                    │
                    └ C2 C1 S2 S1
                      C2 -C1 S2 -S1
```

Wherein the values of auto-correlation functions of the orthogonal complementary code group formed on upper and lower trees after spread are zero everywhere except at the origin, while the cross-correlation functions will form a zero correlation window around the origin with the size of the window at least 2N-1.

9. The improvement to the spread-spectrum receiver, as set forth in claim 8, wherein the above spread can be kept going on in accordance with the tree structure so as to generate $2^{n+1}$

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orthogonal complementary code groups with the code length $N2^n$ and the width of the zero correlation window at least 2N-1, in which n = 0,1,2, … is the number of spread times.

10. The improvement to the spread-spectrum receiver, as set forth in claim 8, wherein equivalent transformation can be applied to the resultant orthogonal complementary code group.

11. The improvement to the spread-spectrum receiver, as set forth in claim 9, wherein equivalent transformation can be applied to the resultant orthogonal complementary code group.

12. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein the equivalent transformation can be swap of the forward and backward position of the resultant code group.

13. The improvement to the spread-spectrum receiver, as set forth in claim 11, wherein the equivalent transformation can be swap of the up and down position of the resultant code group.

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14. The improvement to the spread-spectrum receiver, as set forth in claim 11, wherein the equivalent transformation can be swap of the up and down position of the resultant code group.

15. The improvement to the spread-spectrum receiver, as set forth in claim 10, wherein the said equivalent transformation can be negation of code order of each code.

16. The improvement to the spread-spectrum receiver, as set forth in claim 11, wherein the said equivalent transformation can be negation of code order of each code.

17. The improvement to the spread-spectrum receiver, as set forth in claim 10, wherein the equivalent transformation can be interlacement of polarity of each code bit.

18. The improvement to the spread-spectrum receiver, as set forth in claim 11, wherein the equivalent transformation can be interlacement of polarity of each code bit.

19. The improvement to the spread-spectrum receiver, as set forth in claim 10, wherein the equivalent transformation can

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be rotation of each code bit in complex plane in a sequence or without sequence.

20. The improvement to the spread-spectrum receiver, as set forth in claim 11, wherein the equivalent transformation can be rotation of each code bit in complex plane in a sequence or without sequence.

21. The improvement to the spread-spectrum receiver, as set forth in claim 10, wherein the said transformation can be any equivalent transformation that is proven in Mathematics.

22. The improvement to the spread-spectrum receiver, as set forth in claim 11, wherein the said transformation can be any equivalent transformation that is proven in Mathematics.

23. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein the pair of orthogonal complementary code group **(C1, S1)**, (**C2, S2**) refers to that the auto-correlation function and cross-correlation function is respectively the summation of acylic auto-correlation function with cross-correlation functions between codes C, and the

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summation of acylic auto-correlation function with cross-correlation functions between codes S.

24. The improvement to the spread-spectrum receiver, as set forth in claim 23, wherein the code length and the width of the zero correlation window of the pair of basically orthogonal complementary code group can be spread in the following way:

```
                    C1  C2  S1  S2
                    C1  -C2  S1  -S2
C1  S1
C2  S2
                    C2  C1  S2  S1
                    C2  -C1  S2  -S1
```

wherein if each code length of the pair of orthogonal complementary code group **(C1, S1)**, **(C2, S2)** were N, and the width of the zero correlation window were L, then each code length of the spread pair of the orthogonal complementary code group is 2N, while the width of the zero correlation window is 2L+1.

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25. The improvement to the spread-spectrum receiver, as set forth in claim 24, wherein when N = 2, the pair of orthogonal complementary code group includes:

( ++ , +- )

( -+ , -- )

wherein "+" means +1 and "-" -1, while the width of the zero correlation window is 3.

26. The improvement to the spread-spectrum receiver, as set forth in claim 24, wherein the above spread can be kept going on in accordance with the tree structure so as to generate $2^n$ pairs of orthogonal complementary code groups with the code length $N2^n$ and the width of the zero correlation window as $2^nL+2^{n-1}+2^{n-2}+2^{n-3}+\ldots+2^1+1$, in which n = 0,1,2, … is the number of spread times.

27. The improvement to the spread-spectrum receiver, as set forth in claim 26, wherein an equivalent transformation includes applying to the resultant orthogonal complementary code group.

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28. The improvement to the spread-spectrum receiver, as set forth in claim 25, wherein the above spread continues in accordance with the tree structure so as to generate $2^n$ pairs of orthogonal complementary code groups with the code length $N2^n$ and the width of the zero correlation window as $2^nL+2^{n-1}+2^{n-2}+2^{n-3}+\ldots+2^1+1$, in which $n = 0,1,2, \ldots$ is the number of spread times.

29. The improvement to the spread-spectrum receiver, as set forth in claim 28, wherein an equivalent transformation includes applying to the resultant orthogonal complementary code group.

30. The improvement to the spread-spectrum receiver, as set forth in claim 27, wherein the equivalent transformation includes swapping the forward and backward position of the resultant code group.

31. The improvement to the spread-spectrum receiver, as set forth in claim 29, wherein the equivalent transformation includes swapping the forward and backward position of the resultant code group.

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32. The improvement to the spread-spectrum receiver, as set forth in claim 27, wherein the equivalent transformation includes swapping an up and down position of the resultant code group.

33. The improvement to the spread-spectrum receiver, as set forth in claim 29, wherein the equivalent transformation includes swapping an up and down position of the resultant code group.

34. The improvement to the spread-spectrum receiver, as set forth in claim 27, wherein the equivalent transformation includes negating code order of each code.

35. The improvement to the spread-spectrum receiver, as set forth in claim 29, wherein the equivalent transformation includes negating code order of each code.

36. The improvement to the spread-spectrum receiver, as set forth in claim 27, wherein the equivalent transformation includes interlacing polarity of each code bit.

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37. The improvement to the spread-spectrum receiver, as set forth in claim 29, wherein the equivalent transformation includes interlacing polarity of each code bit.

38. The improvement to the spread-spectrum receiver, as set forth in claim 27, wherein the equivalent transformation includes rotating each code bit in complex plane in a sequence or without sequence.

39. The improvement to the spread-spectrum receiver, as set forth in claim 29, wherein the equivalent transformation includes rotating each code bit in complex plane in a sequence or without sequence.

40. The improvement to the spread-spectrum receiver, as set forth in claim 27, wherein the transformation includes any equivalent transformation that is proven in mathematics.

41. The improvement to the spread-spectrum receiver, as set forth in claim 29, wherein the transformation includes any equivalent transformation that is proven in mathematics.

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42. The improvement to the spread-spectrum receiver, as set forth in claim 8, wherein the orthogonal and fading synchronously transmission channel refers to the orthogonal polarized wave.

43. The improvement to the spread-spectrum receiver, as set forth in claim 8, wherein the orthogonal and fading synchronously transmission channel is the time slots without overlap to each other.

44. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein one code or multiple access codes can be allocated based on the needs of the different spread-spectrum signal rate and services of each subscriber to actualize the different quality of priority level services.

45. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein the required spreading spectrum access codes can be adaptively generated based on the zero correlation window required by the different propagation modes, different number of subscribers, and the needs of different spread-spectrum signal rate as well as services, so that there are no inter-signal interference (ISI) and multi access

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interference (MAI) in the corresponding spreading spectrum CDMA system.

46. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein the resultant multiple access codes by the equivalent transformation including meeting needs of network configuration, handoff and enhancement of system capacity, in cellular mobile or fixed point to multi points wireless telecommunications system.

47. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein coding includes, as one of the complex codes, using complex codes.

48. The improvement to the spread-spectrum receiver, as set forth in claim 5, wherein with the improvement to the spread-spectrum receiver includes additional circuitry for any of TD/CDMA, FD/CDMA, WD/CDMA, SD/CDMA or CDMA communications system.

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